

WHAT IS CLAIMED IS:

1. A magnetic head provided with a spin-valve  
type magnetoresistive element in which a ferromagnetic  
layer a direction of the magnetization of which is  
5 substantially pinned for an external magnetic field and  
a soft magnetic layer the magnetization of which can be  
turned according to an external magnetic field are  
laminated via a non-magnetic intermediate layer and  
characterized in that the magnetization of the soft  
10 magnetic layer is rotated according to the external  
magnetic field is induced, a relative angle between a  
direction of the magnetization of the soft magnetic  
layer and a direction of the magnetization of the  
ferromagnetic layer varies and magnetoresistance is  
15 produced, wherein:

a single magnetic domain turning ferromagnetic  
layer is formed on the soft magnetic free layer via a  
non-magnetic separating layer; and

the single magnetic domain turning ferromagnetic  
20 layer turns the soft magnetic free layer a single  
magnetic domain so that the soft magnetic free layer  
has magnetization substantially induced in a direction  
substantially perpendicular to an external magnetic  
field because the soft magnetic free layer and the  
25 single magnetic domain turning ferromagnetic layer are  
magnetostatically coupled via the non-magnetic  
separating layer at the end of track width and a closed  
magnetic circuit is formed.

2. A magnetic head, comprising:

a spin-valve type magnetoresistive element in which a ferromagnetic pinned layer, a non-magnetic intermediate layer, a soft magnetic free layer, a non-magnetic separating layer and a single magnetic domain turning ferromagnetic layer are laminated in the order and are formed in substantially the same track width corresponding to predetermined magnetic field sensing width, wherein:

no ferromagnetic or antiferromagnetic coupling is substantially produced between the soft magnetic free layer and the single magnetic domain turning ferromagnetic layer via the non-magnetic separating layer, the magnetization of the single magnetic domain turning ferromagnetic layer and the magnetization of the soft magnetic free layer are magnetostatically coupled at the end of track width and a closed magnetic circuit is formed;

the soft magnetic free layer is turned a single magnetic domain so that it has magnetization substantially induced in a direction substantially perpendicular to an external magnetic field; and

a direction of the magnetization of the ferromagnetic induced layer is substantially pinned for an external magnetic field, the magnetization of the soft magnetic free layer is turned according to an external magnetic field, a relative angle between the magnetization of the soft magnetic free layer and the

magnetization of the ferromagnetic pinned layer varies, magnetoresistive change is generated in the magnetoresistive element and is detected by a pair of electrodes.

5           3.     A magnetic head according to Claim 1, wherein:

          a bias magnetic field is applied to the ferromagnetic pinned layer by laminating the ferromagnetic pinned layer and an antiferromagnetic film or a hard magnetic film and producing exchange  
10           coupling and the ferromagnetic pinned layer is polarized in a direction substantially perpendicular to an external magnetic field.

          4.     A magnetic head according to Claim 1, wherein:

          the single magnetic domain turning ferromagnetic layer is formed by a hard magnetic film; and

          the hard magnetic film is magnetizing in a direction substantially perpendicular to an external  
20           magnetic field.

          5.     A magnetic head according to Claim 1, wherein:

          the single magnetic domain turning ferromagnetic layer is formed by a layered film having ferromagnetic  
25           or antiferromagnetic coupling between a hard magnetic film and a soft magnetic buffer layer via a coupling film; and

          the magnetization of the hard magnetic film and

the magnetization of the soft magnetic buffer layer are polarized in a direction substantially perpendicular to an external magnetic field.

6. A magnetic head according to Claim 1,  
5 wherein:

the single magnetic domain turning ferromagnetic layer is provided with a hard magnetic film made of oxide including Fe, Co, Ni or Mn.

7. A magnetic head according to Claim 1,  
10 wherein:

the single magnetic domain turning ferromagnetic layer is provided with a hard magnetic film made of a mixture of oxide and ferromagnetic metal.

8. A magnetic head according to Claim 1,  
15 wherein:

the single magnetic domain turning ferromagnetic layer is provided with a hard magnetic film made of a mixture of a semiconductor and ferromagnetic metal.

9. A magnetic head according to Claim 1,  
20 wherein:

the non-magnetic separating layer is made of Ta, Hf, Nb, Ti or W or the oxide of any of these.

10. A magnetic head according to Claim 1,  
wherein:

25 the non-magnetic separating layer is formed by a deposition of a layer including at least one of Cu, Au, Ag, Pt, Re, Ru, Ir, Os, Ta, Hf, Nb, Ti and W or a layer including these and a layer made of oxide or a mixture

of at least one of Cu, Au, Ag, Pt, Re, Ru, Ir, Os, Ta, Hf, Nb, Ti and W and oxide.